

Hazel



HONOLULU
LA JOLLA
MONTEREY
TIBURON



SOUTHWEST FISHERIES CENTER

MONTHLY REPORT - AUGUST 1984

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SOUTHWEST FISHERIES CENTER

MONTHLY REPORT - AUGUST 1984

Status of Publications

Published

Alcorn, D. J., and J. R. Henderson. 1984. Resumption of nursing in "weaned" Hawaiian monk seal pups. 'Elepaio 45(2):11-12.

Balazs, G. H. 1983. Sea turtles and their traditional usage in Tokelau. Atoll Res. Bull. 279:1-30.

The conservation status, ecology, and cultural importance of sea turtles at the three Polynesian atolls of Tokelau are presented. The green turtle, Chelonia mydas, is the most common species, occurring as a migrant breeder mostly during September through November. The hawksbill, Eretmochelys imbricata, is present in small numbers at all three atolls, but nesting is only known at Nukunonu Atoll. A third species, the loggerhead, Caretta caretta, has also been recorded on rare occasions. In Tokelau, sea turtles are considered "sacred fish" (ika ha) that must be shared among the entire village by an equitable system known as inati. The number of sea turtles has declined within historical times apparently as a result of modern and more efficient hunting methods.

The main objective of this research is to help the Tokelauans effectively manage sea turtles so that these animals can continue to be part of the native diet and culture. Based on this study's findings, 11 recommendations for conservation are offered that either build upon, or reinforce, existing traditional practices. These conservation measures may also be applicable to sea turtle populations used by other insular people of the Pacific.

Boehlert, G. W., and M. M. Yoklavich. 1984. Carbon assimilation as a function of ingestion rate in larval Pacific herring, Clupea harengus pallasii Valenciennes. J. Exp. Mar. Biol. Ecol. 79: 251-262.

During the larval stage, clupeoids and some other fishes are characterized by straight, relatively undifferentiated guts. Where it has been studied in detail, the evacuation rate in these larvae appears to be directly related to ingestion rate, which is in turn related to food concentration. Qualitative assessments

have suggested that the degree of digestion of food particles is inversely related to the rate of evacuation. In the present study, early larvae of the Pacific herring, Clupea harengus pallasi Valenciennes, were fed for one hour upon ^{14}C labelled rotifers, Brachionus plicatilis Muller, and Artemia nauplii at high densities. At the end of one hour, larvae were transferred to six food densities, ranging from 0 to 10 unlabelled prey ml^{-1} . After 22 h, larvae were removed from the feeding tanks and sacrificed. The labelled carbon remaining in the larvae as a function of the percentage consumed after the 1-h feeding interval was used as an index of carbon assimilation. The percentage carbon retained decreased significantly with increasing food concentration. Larval herring thus decrease carbon assimilation from individual food particles at high food densities. The magnitude of increasing ingestion, however, more than compensates for the decreased carbon assimilation, and larvae gain greater total energy under conditions of high food concentration. The results support the suggestion that clupeoid larvae are adapted to utilize high food concentrations associated with plankton patches in the pelagic environment.

Eldridge, L. G. 1983. Summary of environmental and fishing information on Guam and the Commonwealth of the Northern Mariana Islands: Historical background, description of the islands, and review of the climate, oceanography, and submarine topography. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-40.

Hobson, Edmund S. 1984. The structure of reef fish communities in the Hawaiian archipelago, pp. 101-122. In R. W. Grigg and K. Y. Tanoue (eds.), Proceedings of the Second Symposium on Resource Investigations in the Northwestern Hawaiian Islands. Sea Grant Misc. Rep. UNIHI-SEAGRANT-MR-84-01.

This paper describes how the great variety of reef habitats in the Hawaiian archipelago has influenced the distribution of reef-fish species, and also how this distribution has been modified by fishing pressures. The basic Indo-West Pacific derivation of this fauna is most pronounced at the southeastern end of the archipelago, and at French Frigate Shoals, which is at the center. Many species at the northwestern end are related to temperate West Pacific species, and these are fewer, or occur in deeper water, southeastward. The southeastward distributions of species that predominate in the northwestern communities are limited by both environmental and fishing pressures, but the northwestward distributions of fishes that dominate in the southeastern communities are limited only by environmental pressures.

Matsumoto, W. M. 1984. Potential impact of deep seabed mining on the larvae of tunas and billfishes. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-44.

Assessment of the probable impact of deep seabed mining on the eggs and larvae of tunas and billfishes is made, based largely on studies of the effects of sedimentation on eggs, larvae, and adults of freshwater, estuarine, and a few marine fishes. Most of the changes to the environment resulting from mining, such as increased suspended sediment particles, reduced illumination due to turbidity, mixing of cold bottom water with surface water, and changes in trace metals, salinity, and oxygen levels of the surface water, are not extensive enough to endanger tuna and billfish eggs and larvae. One probable effect, temperature of discharge, is acknowledged, but its effects are expected to be insignificant. Cold bottom water (4°-10°C) discharged over the side of the mining ship and falling directly onto tuna eggs and larvae at the surface could cause thermal shock, resulting in the termination of embryonic development, development of abnormal larvae, and loss of equilibrium by the larvae. Losses from thermal shock, estimated annually at 15.3 metric tons (MT) of skipjack tuna and 10.7 MT of yellowfin tuna, representing 0.16 and 0.04% of the total annual catches of the respective species in the eastern Pacific northern fishery (the fishery north of Mexico), are insignificant and are not likely to have any noticeable impact on the fishery. These losses could possibly be increased fourfold, if the mining ship were to act as fish aggregating devices, but even at these higher levels, the impact on the fishery would be negligible.

Smith, Susan E. 1984. Timing of vertebral band deposition in tetracycline-injected leopard sharks. Trans. Am. Fish. Soc. 113(3): 308-314.

In late summer of 1979, 948 leopard sharks, Triakis semifasciata, were tagged and released into San Francisco Bay after being injected with the bone-labeling reagent oxytetracycline (OTC). The fluorescent time mark was compared to new growth zones in the vertebral centra of tagged fish recovered over 3 years to determine how often the calcified bands are formed. Although OTC deposition was variable, an intense fluorescent mark was evident in 12 of the 25 vertebral samples recovered. The results confirm that one opaque (highly calcified) zone and one translucent zone are deposited per year, and that these zones can be used reliably to age this species within the size group examined. The progression of band formation indicates that opaque zones probably form sometime between May and September.

Sund, Paul. 1984. Atlas of airborne sea surface temperature observations in nearshore California waters 1980-83. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-43.

Approved by Center Director

Hewitt, Roger, Gail Theilacker, and Nancy Lo. Causes of mortality in young jack mackerel. For consideration for publication in Marine Ecology: Progress Series.

Lo, N. C. H. and T. D. Smith. Incidental mortality of dolphins in the eastern tropical Pacific 1959-1972. For consideration for publication in Fishery Bulletin, U.S.

Vetter, Elizabeth F. Heat flux through a small cetacean (the spotted dolphin, Stenella attenuata): relationship to forage requirements and effects of body size. For consideration for publication in the Canadian Journal of Zoology.

Translation

Marsac, F., and B. Stequert. 1984. Summary of the exploration for surface tuna resources since 1971 in the western Indian Ocean. La Peche Maritime, February 20, 1984, P. 83-94. (Engl. transl. by W.G. Van Campen, 1984, Transl. No. 98; available Southwest Fish. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96812.)

Administrative Reports

Skillman, R. A., and D. K. H. Louie. Inventory of U.S. vessels in the central and western Pacific. Phase II--Verification and classification of Hawaiian vessels. A simple summary of responses. Southwest Fish. Cent. Admin. Rep. H-84-12.

Skillman, R. A., A. R. Everson, and G. L. Kamer. Prospectus. Escape vent experimental procedure for the spiny lobster fishery under management of the Magnuson Fishery Conservation and Management Act. Southwest Fish. Cent., Admin. Rep. H-84-13.

HONOLULU LABORATORY

Honolulu, Hawaii

Insular Resources Investigation

Shipboard Spawning and Rearing of Demersal Fishes Successful

Demersal fish have been successfully spawned and reared aboard ship. This work is being conducted to provide voucher series of important insular species, since for many of these species, the larvae cannot be identified in plankton collections. On NOAA Ship Townsend Cromwell cruise TC-84-05, research assistant Yara Lamadrid-Rose successfully completed artificial fertilization experiments on two species of demersal fishes. On the seamount portion of the cruise, a pair of alfonsin, Beryx splendens, was spawned. Eggs were maintained in cubitainers at 22°-24.5°C and began hatching at 37 hours after fertilization. Larvae were kept alive through the yolk-sac stage, about 3 days after hatching. Larvae did not initiate feeding, probably due to inadequate food sources. The second species was the kalekale, Pristipomoides sieboldii; a pair was spawned after capture in the Northwestern Hawaiian Islands (NWHI). Maintained at 23°-24.8°C, the eggs hatched in 37 hours. Again larvae did not begin feeding and died after the yolk was exhausted approximately 3 to 4 days after hatching.

In addition to the spawning work, several mature taape, Lutjanus kasmira, were collected in the NWHI and returned alive to the Kewalo Research Facility where they will be maintained as potential broodstock to develop improved techniques for rearing the larvae of snappers.

* * * * *

Dr. George Boehlert and research assistants Michael P. Seki and Darryl T. Tagami attended the open house in Honolulu of the Oshoro Maru from Hokkaido University, Hakodate, Japan. Three pelagic armorhead, Pentaceros richardsoni, caught in the North Pacific by longline on the Oshoro Maru were presented to the Honolulu Laboratory.

Fishery Management Research Program

Reports Presented at Council Meetings

Dr. Robert A. Skillman, Leader, Fishery Management Research Program, and Samuel G. Pooley, Industry Economist, attended the Western Pacific Regional Fishery Management Council's Scientific and Statistical Committee (SSC) and Advisory Panel meetings in Kona, Hawaii in August. Skillman also attended the Council meeting.

Skillman and Pooley presented reports on the Laboratory's spiny lobster escape vent experiment, the progress that has been made in collecting gonad samples of uku, Aprion virescens, for determining size at first spawning, the vessel inventory questionnaire survey, the correlation of pelagic management unit species catch, effort, and catch per unit of effort (CPUE) statistics for Hawaiian fishing gears and Japanese longline gear, and several socio-economic projects. During discussions on crustacean fisheries, members of the SSC indicated that an evaluation should also be made of the escapement of slipper lobster, which is an incidental but important component in the catch of the commercial spiny lobster fishery. Members also noted that the question of ghost fishing should be considered. On the developing deep-sea shrimp fishery, the SSC voiced concern about the collection of catch and effort statistics and size composition data, and also the verification of the estimates of biomass and sustainable yield that have been made. Regarding bottom fish, the presentation of stock assessment results for the opakapaka, Pristipomoides filamentosus, by Dr. Stephen Ralston, Fishery Biologist, was well received and convinced meeting participants that the species is overfished in the main Hawaiian Islands and is showing signs of approaching that condition in the NWHI. Subsequent discussions by the SSC and the Bottomfish Advisory Subpanel centered on the overfishing problem and the possibility of implementing limited entry schemes in the western Pacific.

The report on the spiny lobster escape vent experiment included results of laboratory trials and the first trials on the NOAA Ship Townsend Cromwell. The laboratory trials, which were conducted by research assistant Alan R. Everson, indicated that an escape vent with a vertical opening of 55 mm resulted in low escapement of minimum legal size (77-mm carapace length) spiny lobsters and relatively high escapement of lobsters below legal size. Lobster traps with escape vents of 54, 55, and 56 mm were set on June 21-28, 1984, off Necker Island during the trials on the Townsend Cromwell. The catch rates (number per trap night) are presented in Table 1.

Table 1

Vent size (mm)	Legal size ¹		Sublegal size ¹		Berried females		No. of traps	
	Control	Vented	Control	Vented	Control	Vented	Control	Vented
54	1.23	1.68	4.60	0.31	1.10	0.21	77	78
55	1.58	2.18	4.75	0.21	1.42	0.24	76	76
56	1.29	1.61	4.15	0.19	1.30	0.25	80	80

¹Includes berried lobsters.

Traps with escape vents had higher catch rates of legal spiny lobsters and lower catch rates of sublegal lobsters. A surprising, though beneficial, result was that the vented traps also caught fewer berried females than the unvented traps.

* * * * *

Samuel Pooley reported that design work on the Hawaii Recreational Fishing Valuation Study proceeded with a number of meetings with the contractor, Phil Meyer of Meyer Resources, Inc., Davis, California. Representatives of a Hawaii State agency participated in one of the meetings. The project has also been discussed at several meetings of the SSC. While the design phase is nearly completed, approval from the Office of Management and Budget for the project is yet to be obtained. Meyer is exploring ways to expand the study to American Samoa and Guam.

* * * * *

Research assistant Wesley K. Higuchi assisted Samuel Pooley in correcting fresh fish transactions data for serial correlation. The Hildreth-Lu procedure used in the analysis involves an iterative scaling of the data to reflect a simple first order autoregressive lag relationship. The corrected data are being used to determine price responsiveness to quantity in Hawaii's fresh fish market.

* * * * *

Research assistant Nathaniel T. Shippen and Samuel Pooley examined the National Recreational Fishing Survey data tape for 1979. They are interested in seeing if size-frequency data and modes of fishing participation data can be gleaned from the raw data.

Fishery Data Expansion System Completed

David C. Hamm, Computer Systems Analyst, reports that programming of the initial release of the Guam Inshore Expansion System (GIES) was completed during August. This totally menu-driven system is patterned after the Guam Offshore Expansion System and includes seven major programs for processing survey sample data to make estimates of island-wide catch, effort, and CPUE participation by fishing method and month. The Guam Division of Aquatic and Wildlife Resources (DAWR) conducts creel surveys and interviews of fishermen several days every month and makes participation counts by fishing method. Data are entered into data bases established by Western Pacific Fishery Information Network (WPACFIN) and are translated into formats processible by the expansion system. The GIES outputs include four major reports, several minor reports, and several summary computer files that will be used in later data base processing on the central WPACFIN computer. The system has been sent to DAWR for further testing and comments.

Landings data from American Samoa, Guam, and the Northern Marianas were summarized in several ways for use by the Honolulu Laboratory, the Southwest Fisheries Center, and the Southwest Region. Additionally, a contract was awarded to DAWR to act as liaison between WPACFIN and commercial fish dealers in Guam and to provide coding and computer support for expansion of the Guam commercial landings data. Forms for the collection of landings data by species were developed and distributed to two more Guam fish wholesalers that

have agreed to provide data to WPACFIN. Historical data from these wholesalers have already been obtained and are being processed. All of the historical data from one of the two wholesalers were edited, coded, and added to the Guam data base on the central WPACFIN computer.

Pelagic Resources Investigation

Yellowfin Tuna Tagged with Sonic Tag Recaptured by Fisherman

During the second week of August, Kim Holland of the Hawaii Institute of Marine Biology, Randolph K. C. Chang, Fishery Biologist, and research assistant Gregory M. Weber successfully tracked another small (approximately 60 cm fork length) yellowfin tuna, Thunnus albacares, that had been tagged with a depth sensitive ultrasonic transmitter. The fish was originally caught near the 91-m (50-fathom) isobath off Makua Valley (Waianae coast of Oahu, Hawaii). The objective of this track was to determine the behavior and movements of a fish that was caught far from a fish aggregating device (FAD). There were flocks of seabirds and numerous yellowfin tuna schools in the immediate vicinity of the tagged fish indicating the presence of significant amounts of baitfish. This may explain why the fish remained in the immediate area in which it was originally caught and did not move offshore to any of the three FADs located off the Waianae coast.

The track was terminated after 24 hours to allow the crew to rest. The following day, the RV Kaahale'ale returned to the area where the fish was originally caught, and the fish was relocated and tracked for an additional 4 hours before the transmitter's batteries failed.

Surprisingly, the fish tagged with the ultrasonic tag was recaptured on August 23 by a local fisherman, David Snodgrass, near FAD "R" located off the Waianae coast. Although the fish was not available for examination Snodgrass reported that it appeared normal and healthy. This recapture of a tagged fish indicates that small yellowfin tuna will remain in a relatively small area for up to 3 weeks and that the ultrasonic transmitters and attachment methods do not adversely affect the tagged fish.

To update the results of the tuna tracking experiments, Chang has completed the computer generated plots of the swimming depth data from all the tracks of tunas obtained so far. The data are plotted at 10-second intervals for the entire duration of the track and represent some of the most detailed records ever obtained of tunas' swimming depth behavior.

Investigations of Magnetic Sense of Yellowfin Tuna and Kawakawa Continue

Dr. Michael M. Walker, Cooperating Scientist, Gregory Weber, and NOAA Junior Fellow Theresa Villanueva continued a study on the ability of yellowfin tuna and kawakawa, Euthynnus affinis, to detect changes in the earth's

magnetic field. The tests on yellowfin tuna are designed to determine the minimum magnetic field change detectable by this species. The technique involves teaching a fish to swim through a hoop once during each trial. The fish gets a food reward if it makes a correct response, or a mild electric shock if it makes an incorrect response. Using a light as the stimulus, yellowfin tuna have been trained to make 100% correct responses. Attempts to train a yellowfin tuna using a magnetic stimulus are in progress. Once the fish is trained and is responding correctly, the strength of the magnetic stimuli will be reduced until the fish's performance approaches chance (i.e., until the fish can no longer detect the change in the local magnetic field).

A kawakawa is difficult to train when it is alone in a tank. Therefore, a technique is being developed where a small school of kawakawa can be tested for the ability to detect changes in the local magnetic field. The technique involves video taping the response of kawakawa when a change in the local magnetic field is paired with the delivery of food to one area of the tank. If indeed kawakawa can detect changes in the earth's magnetic field, they should then respond to the magnetic field stimuli by moving to the area of the tank where the food will be delivered. Preparation of the tank, video taping system, and food delivery system has been completed and tests were begun during the month.

* * * * *

Richard N. Uchida, Acting Chief, Pelagic Resources Investigation, served as Acting Laboratory Director in the absence of Richard S. Shomura. Uchida continued work on the seamount workshop papers and on the background document for the workshop on Fate and Impact of Marine Debris. He also completed the narrative section of the Management by Objectives on western Pacific and Indian Ocean tunas, responded to a request from the Southwest Fisheries Center on a Management Training Program and Executive Skill Profile, provided a status report on milestones listed in the Center Director's Senior Executive Service Contract, and revised the Honolulu Laboratory's guidelines for the preparation of cruises.

COASTAL FISHERIES RESOURCES DIVISION

La Jolla, California

SWFC is Site of Planning Meeting for International Fisheries Recruitment Program

A critical problem for fishery scientists and managers is that of ascertaining how intensively a population of fishes can be fished while still ensuring that a sustained yield of fish can be maintained in future years. The problem is further complicated by the fact that the number of fish that enter a fishery (recruitment) may not necessarily depend on the number of adult fish but rather on environmental factors that are beyond the control of man, as for example, the recent widespread warm-water phenomenon called El Niño.

A concerted effort to understand this basic problem is now underway. The National Marine Fisheries Service is the co-sponsor with other member states of the Inter-Governmental Oceanographic Commission of an international program called Ocean Sciences in Relation to Living Resources (OSLR).

In partial implementation of this program, Reuben Lasker and staff from the Southwest Fisheries Center have been involved in the planning of a fisheries recruitment program now known as the International Recruitment Program (IREP). From November 5 through 9, 1984, a meeting jointly sponsored by the Inter-Governmental Oceanographic Commission and the Southwest Fisheries Center will bring together representatives from Argentina, Brazil, Chile, Ecuador, Mexico, Peru, Morocco, Portugal, Spain, and the United States to plan for the conduct of cruises and the accompanying laboratory work in a subprogram of IREP called the Sardine and Anchovy Recruitment Project (SARP). The similarity throughout the world among upwelling systems which contain sardines, anchovies, mackerels, and hake provides scientists with the opportunity to combine their resources in many places at one time to attack the recruitment problem. The Southwest Fisheries Center in La Jolla, California, has long been a pioneer in such studies and their fishery scientists will provide the training and expertise required by these countries to mount a SARP investigation.

Coastal Eastern Pacific Population Biology of Fishes

Progress Made in Age Determination of Sardines

Fishery biologist John Butler has completed ageing sardine juveniles collected by California Fish and Game during October 1983. Butler reports that the process of determining age in juvenile sardines using daily increments is comparable to that of juvenile anchovy. Daily increments near

the focus of the otolith are more difficult to read in sardine than in anchovy otoliths due to the smaller size of sardine otoliths at the same fish length. Preliminary analysis of the back-calculated date of spawning (Figure 1) indicate that sardine spawning and recruitment came from about the same time of year as the anchovy (Figure 2). Peak spawning of sardines appears to be a month later than that of the anchovy. Further analysis of the region of the otolith near the focus may shift the sardine peak to earlier in the year. Butler and Susan Longinotti, Biological Technician, will use scanning electron microscopy to enhance the region near the focus and correct for any underestimation of the age of sardines.

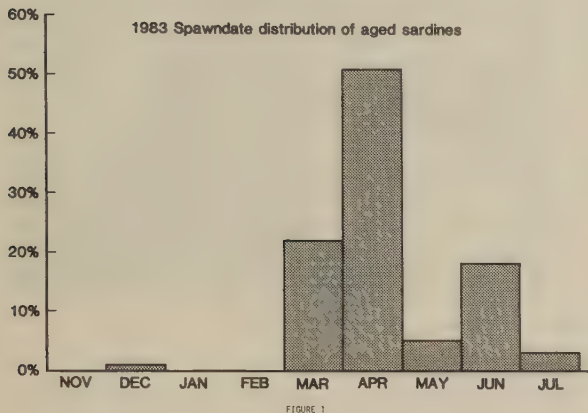


FIGURE 1

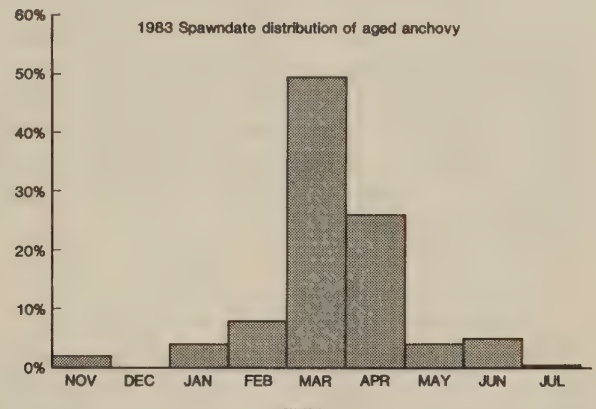


FIGURE 2

In a related study, Blanca Rojas de Mendiola, IMARPE, continues her work with Butler on the age and growth of larval sardines. Mendiola is photographing selected otoliths using light microscopy in preparation for using a scanning electron microscopy to confirm observations made with light microscopy.

NOAA Junior Fellow Marlene Johnson continues her studies with Butler on the fat content of sardines and anchovies. Johnson has completed measuring the fat content of anchovy and is now working on sardines collected at the same time.

Butler reports that a paper that he wrote with Dr. Koichi Kawaguchi of the University of Tokyo has been published. The paper entitled, "Fishes of the genus Nansenia (Microstomidae) with descriptions of seven new species," describes a new species Nansenia ahlstromi in honor of the late Dr. Elbert H. Ahlstrom, eminent Senior Scientist and Ichthyologist at the La Jolla Laboratory who pioneered studies in larval fish biology.

NRC NOAA Fellow Begins Research Project on Anchovies

Patti Schmitt arrived at the Center from Australia to begin her appointment as National Research Council NOAA Fellow. Schmitt received her Ph.D. from the University of Sydney, Australia, where she did her dissertation on larval ecology of a tropical atherinid fish (*Hypoatherina tropicalis*) in a coral reef lagoon. At the Center, she will be working with Dr. John Hunter on the feeding ecology of the late larval anchovies. She is using a laboratory experimental approach to determine how feeding rate and prey selectivity changes with larval size and with prey concentration.



Survey Systems Development and Evaluation

Five-year Anchovy Egg Production Rate Stable Through El Niño 1982-83

Dr. Paul Smith has prepared a report for the "International Recruitment Investigations of the Subarctic" (IRIS) in which he highlights some of the oceanic biological changes similar to those experienced in the "El Niño" of 1983. For example, the reproductive biology of the northern anchovy, a coastal plankton feeder, changed remarkably little in 1983 when compared with the 20-fold decline in zooplankton reported by Prof. John McGowan of the Scripps Institution of Oceanography (Oceanus 1984). Changes in the reproduction parameters of the northern anchovy are shown in Tables 1 and 2. There appeared to be a significant enlargement of the spawning area and a small increase in mortality rate. There were also decreases in female weight, specific fecundity, and batch production rate (Table 2).

Smith, Larry Eber, and Celeste Santos have prepared time series of biological and environmental data for Dr. Geoffrey Moser to analyze changes in the fish fauna of the California Current.

Table 1. Reproduction parameters for central population of northern anchovy (Engraulis mordax).

Cruise	Spawning area (sq. mi.)	Spawning biomass '000 t	g/m ²	Mortality rate z	%/d
Mar. 1980	19000	870	13	.453	36
Feb. 1981	23000	635	8	.138	13
Apr. 1981	17000	372	6	nil	nil
Feb. 1982	24000	415	5	.158	15
Feb. 1983**	28000*	652	7	.184	17
Mar. 1984	18000	309	5	.170	16

*About half the area of the state of Washington.

**El Niño year.

Table 2.

Cruise	Female weight g	Specific fecundity m-eggs/d/t	Mean interval days
Mar. 1980	17	30	7
Feb. 1981	13	33	9
Apr. 1981	16	34	8
Feb. 1982	19	33	8
Feb. 1983**	11	24	11
Mar. 1984	12	42	6

Commercial and Recreational Fisheries Research for Management

Rockfish Study Shows Deviations from Common Growth Curve

Fishery biologist John MacGregor has completed age determinations for four species of rockfishes found off southern California: Bocaccio (Sebastes paucispinis), olive rockfish (S. serranoides), whitebelly rockfish (S. vexillaris), and vermilion rockfish (S. miniatus). Analysis of the growth data shows a consistent deviation from the von Bertalanffy growth curve, which is commonly used to describe fish growth. MacGregor has found that their growth curves are less curved than is shown by the best-fitting von Bertalanffy curve, i.e., the latter model underestimates mean size of young and old fish, and overestimates mean size of intermediate aged fish. This

agrees with results of earlier investigations on other species of rockfishes (Sebastes spp.). Nonetheless, the von Bertalanaffy growth curve provides a better description of rockfish growth patterns than do the other common growth models used in fishery analysis.

Workshop Convened on Pelagic Fish Abundance Estimation

Dr. Alec MacCall convened a workshop August 14 to determine what biologists need to know in order to select or develop more cost-effective methods of abundance information for pelagic fishes. Participants in the workshop included Reuben Lasker, Richard Methot, James Squire, and Paul Smith from the Coastal Fisheries Resources Division, Roger Hewitt from NOAA Corps, and Richard Klingbeil, Kenneth Mais, and Patricia Wolf from the California Department of Fish and Game (CF&G).

Annual abundance information is required for three species of pelagic fishes off California: anchovy, sardine, and Pacific mackerel. The provisions of the Anchovy Fishery Management Plan require an annual estimate of spawning biomass, which is done by the SWFC, while the State of California requires the CF&G to produce annual estimates of abundance of sardines and Pacific mackerel for establishing fishery harvest levels for those two species. In the case of anchovy, the recent lack of reduction fishery activity in U.S. waters makes it awkward to justify costly estimates of abundance where less expensive methods might suffice. On the other hand, there is intense fishery interest in Pacific mackerel, and improved precision of biomass estimates could justify increased expenditures for that species.

The workshop examined a wide variety of methods and technologies, such as egg and larva based methods (including the Egg Production Method), acoustic methods, aerial surveys, fishery monitoring, and approaches to combining information. In many cases, present knowledge is inadequate for purposes of comparing evaluating methods. The participants in the workshop compiled a list of projects that would help fill these gaps. While the recommendations were specific, many of them fell into four broad categories: 1) establish or improve the statistical basis of the information or abundance estimate (e.g., aerial spotter logbooks, multispecies landings sampling, sardine larva census from a modified CalCOFI survey pattern); 2) evaluate the precision and sample size relationship of the estimate (nearly all methods); 3) develop methods of "mixing" sources of information (e.g., aerial pre-surveys, Methot's work toward a cohort-based abundance model); and 4) develop criteria for comparative cost-accounting (various methods use different sources of manpower and funding). The report of the workshop will be included as an appendix to the Management Information Document presently being produced for southern California wetfish species.

New Fisheries Economist Joins Coastal Division
Joins Coastal Division

Dr. Dale Squires recently joined the staff of the Coastal Fisheries Resources Division as a fisheries economist. Before coming to the SWFC, he worked at the NMFS Northeast Regional office in Gloucester, Massachusetts. He received his Ph.D. in Resource Economics from Cornell University where he wrote a dissertation on production economics and fishery management of the New England groundfish fishery. His work at the SWFC will emphasize economics of the West Coast groundfish fisherie.



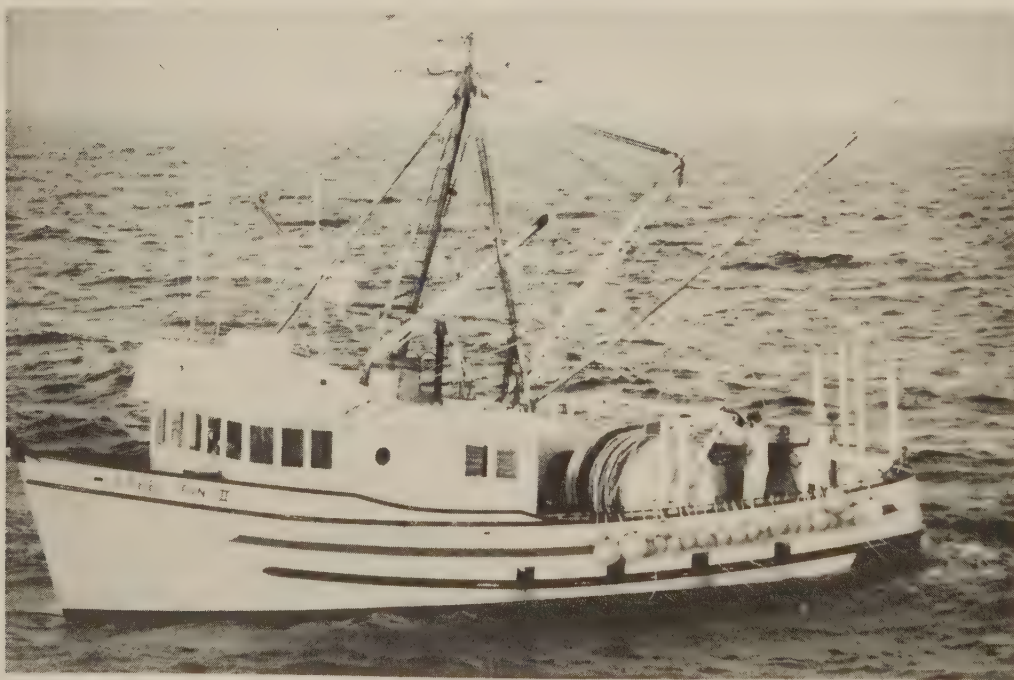
OCEANIC FISHERIES RESOURCES DIVISION La Jolla, California

Tuna Assessment Investigations

NOAA Ship David Starr Jordan Joins Chartered Gill Netter in Experiment to Assess Albacore Population

Albacore, the prized white meat tuna, is the only temperate tuna species caught off the U.S. west coast. It is a valuable fisheries resource, worth an estimated \$24,000,000 at the retail level.

To learn more about the size structure of the albacore population and to assess the relative catching effectiveness of trolling versus gill netting, a 20-day cruise was conducted by the scientists of the Oceanic Fisheries Resources Division in La Jolla, California, on the NOAA Ship David Starr Jordan, and a chartered gill netter, the Steel Fin II from August 8 to 27.



David Holts, Fishery Biologist, aboard the charter vessel,
Steel Fin II, albacore gill nets.

Under the scientific leadership of fishery biologist Dr. Norm Bartoo aboard the Jordan and his colleague, David Holts, aboard the Steel Fin II, the two vessels moved to an area 100 to 200 miles off southern California where U.S. commercial jig boats were working. The gill netter made 12 experimental gill net sets which produced 466 albacore and 233 skipjack tuna. Working with

the Jordan, the gill netter also trolled for albacore. The two vessels recorded about 500 total hours of fishing time, catching 864 albacore and 296 skipjack tuna.

According to Bartoo, sufficient information on the albacore population was collected off southern California south of Pt. Conception and north of Ensenada, Mexico, in the U.S. Fishery Conservation Zone to compare the size and structure of the commercial catch and the underlying population assess gear effectiveness. Temperature and salinity profiles were made concurrently with all net operations and these data are currently being analyzed by Bartoo and his staff in the Tuna Assessment Program.

Yield per-recruit of Atlantic Albacore Assessed

Earl Weber, Fishery Biologist, and visiting Fishery Biologist Alberto Garces of the Instituto Espanol de Oceanografia, La Coruna, Spain, have completed a study of yield-per-recruit of north Atlantic albacore. The draft manuscript describes the assessment of the yield-per-recruit of north Atlantic albacore that was conducted during Garces stay at the SWFC. This study differs from previous studies primarily because it involves a probability matrix approach to estimating the ages of fish in the catch. Results will be presented at the upcoming meeting of the International Commission for the Conservation of Atlantic Tunas in the Canary Islands.

Marine Mammal Assessment Investigations

Optimum Season for Dolphin Sighting Surveys Reviewed

Drs. Steve Reilly, Operations Research Analyst, Doug DeMaster and Rennie Holt recently completed a review of average weather conditions which are prevalent at different seasons in areas of the eastern tropical Pacific Ocean in which dolphin sighting surveys are conducted. The review consisted of compiling data on average sea state and frequency of hurricanes.

The review was prompted by the recent reauthorization of the Marine Mammal Protection Act which mandates a four-year program for monitoring the abundance of dolphin. The program emphasizes shipboard surveys to estimate relative abundance on an annual basis as opposed to the more expensive aerial surveys used in previous years to estimate absolute abundance. In order to conduct shipboard surveys, it is necessary to evaluate which season is the most favorable for conducting surveys.

Previous surveys have shown that the efficiency of dolphin sighting decreases markedly when white caps become prevalent, which occurs at sea state Beaufort 4 and above. The frequent occurrence of sea states of Beaufort 4 and greater in the area west of 120°W longitude and north of the equator has been a continuing problem during previous surveys which had been conducted in the winter.

The proportion of the time that the average sea state exceeds Beaufort 4 is shown in the accompanying figure (Figure 1) for the two areas having worst weather the northwest (west of 120°W longitude, north of the equator), and south of the equator. Also shown is the frequency of hurricane level storms which originate off Central America, north of the equator and generally proceed to the west and north. For surveys conducted over a 4-month period the survey season must be selected to minimize the amount of survey time at high Beaufort and to minimize the likelihood of encountering severe storms.

Based on advice received from experts and on analysis of seasonal patterns there does not appear to be a completely acceptable 4-month survey period. From the alternatives, however, the best period appears to be from September through December.

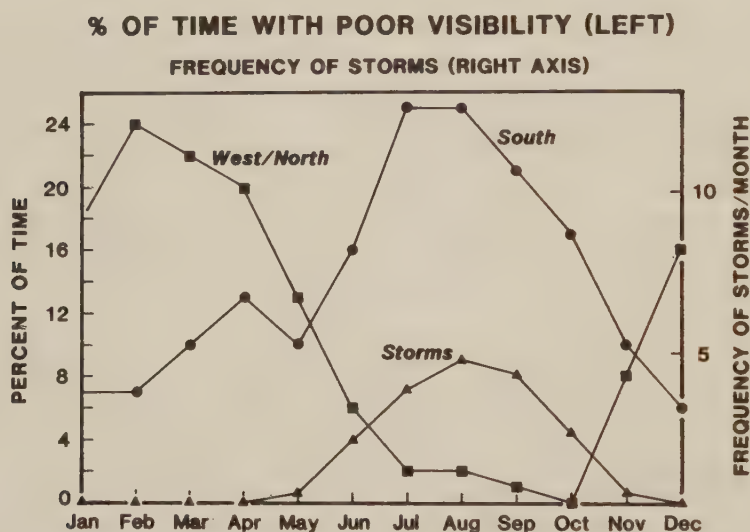


Figure 1.

Aerial Photographs Indicate Possible Recovery of Populations of Fur Seal Pups

During recent studies to assess populations of fur seals at San Miguel Island, Wayne Perryman, NOAA Corps Officer, found that the number of pups increased in 1984. The purpose of the study, which was funded by NOAA's Marine Sanctuary Program, is to develop a photographic technique to census pinniped populations within the Channel Islands Marine Sanctuary.

Aerial photographs of fur seal and sea lion pups on rookeries were made in July 1982, July and August 1983, and July 1984. Photographs were taken and initially interpreted by Pacific Western Aerial surveys, Santa Barbara, under contract to the Marine Sanctuary Program. Perryman made final interpretations at the Imagery Laboratory, University of California, Santa Barbara.

Counts of fur pup seals made from photographs of two rookeries (Pt. Bennett and Castle Rock) are listed in Table 1. Counts are about 20% lower

than ground counts made at the same locations. Counts using both methods show the same marked decrease in number of pups between 1982 and 1983 and perhaps a partial recovery in 1984.

Sea lion pups were difficult to distinguish from the background in the photographs. Perryman is working with the contractor to further enhance the images.

Table 1. Counts of fur seal pups from aerial photographs.

Flight date	Pt. Bennett	Castle Rock	Total count
7/19/82	902	513	1415
7/18/83	366	141	507
8/05/83	365	110	475
7/19/84	443	186	629

Scientists Try to Prevent Sea Lions from Stealing Fish

A common complaint from sports fishermen in San Diego is that sea lions have learned to steal fish off fishing lines. In a project headed by Doug DeMaster, Wildlife Biologist, biologists tried to mark the animals to determine whether a relatively small number of animals was involved or if the behavior was a general pattern throughout the population. Unfortunately, attempts to mark the sea lions failed.

In the last two weeks of August, a number of different techniques were tried to mark individual animals without having to physically restrain them. Pelage tags, spaghetti tags, bleach marks, and dye marks were tried. Animals which were hauled out on the navigational buoys in San Diego Bay were approached by boat. The animals would allow the boats to approach within a few feet before the animals went back into the water. Marking by bleach and dye was therefore ineffective since the animals returned to the water before the materials could be set up. Two problems occurred when trying to apply the pelage or spaghetti tags. The impact of the tag was deflected because the angle of application from the boat was too low, and the tags were, therefore, not seated properly. In addition, the animals went into the water before the position of the tag could be accurately determined. Researchers were deployed on the buoys to gain a better tagging angle. The animals were found to haul out on the buoy relatively quickly if the researcher on the buoy was quiet and motionless. It was still not possible, however, to adequately seat the spaghetti tag because of the thickness of the animal's hide and the pliable nature of the tag. Future efforts will be directed at using more conventional marking procedures. Animals will be netted while their flippers are marked.

Meeting Held on Squid Assessment

An informal meeting of the SWFC scientists was held on May 15, 1984, to discuss potential research on populations of cephalopods. Participants included Steve Reilly (convener), Tim Smith, Pierre Kleiber, John Hedgepeth and Gary Sakagawa (Oceanic Division), John Hunter, Alec MacCall and Paul Smith (Coastal Division), Walter Matsumoto (Honolulu Laboratory) and Sus Kato (Tiburon Laboratory). Saburo Machida (Japanese Marine Fishery Resource Research Center, Tokyo) was a guest at the meeting. Machida was in San Diego to join a JAMARC-chartered vessel to begin a one-year cruise of exploratory squid fishing in the eastern Pacific. The informal meeting was held to share information about the population biology of squids and to discuss assessment techniques.

The SWFC is interested in pelagic cephalopods of the eastern tropical Pacific Ocean (ETP) for a number of reasons. Squids appear to be an important prey item for dolphins, tunas and birds of the pelagic tropical Pacific. In fact, ommastrephid squids are the key items of dietary overlap among the dolphins, tunas and birds of the region, many of which forage together. A better understanding of the squid populations could provide important insights for the management of tropical dolphins and tunas. Further, the presence of squids in stomachs of pelagic predators suggests that squids are abundant and widespread, and may provide potential for expansion of commercial fisheries.

In the absence of a significant fishery for squid in the ETP there are no reliable estimates of abundance, or biomass, of pelagic cephalopods in the region. Any advances in squid assessment methodology would provide a major contribution to fishery science and biological oceanography in general.

A variety of potential squid assessment techniques were discussed during the meeting, including acoustic and trawl surveys, drift gill nets and automatic jigging machines, the egg-production method and predator food habits. Steve Reilly briefly recounted the preliminary work conducted by the Oceanic Division. Walter Matsumoto reviewed the research conducted by the Honolulu Laboratory jointly with Hokkaido University in the waters around Hawaii. Sus Kato discussed some aspects of the current status of Loligo assessment, and Alec MacCall discussed his indirect Loligo assessment, which is based on predator food habits.

The following points were made during the course of the meeting:

- 1) Methods need to be matched to specific aims. For example, indexing relative abundance would dictate a different approach than estimating biomass.
- 2) For direct estimation of abundance, acoustic surveys from research vessels are the most promising tool. Such surveys should be coupled with sampling such as with night jigging or gill netting to verify the identity of acoustically recorded targets.

Development of this technique is necessary prior to planning an actual survey. Development could be conducted in California waters on Loligo during the non-spawning phase.

3) Trawl surveys are not practical for assessing abundance of adult oceanic squids. Avoidance and patchiness combine to make trawls very inefficient for this purpose. In the north Pacific, trawls are used to survey the abundance of larval ommastrephids, but not for adults. Trawl surveys may have potential for this purpose in the ETP.

4) Drift gill nets are used in the north Pacific Japanese squid fisheries and in other cases and are effective to sample many types of pelagic squids. The possible selectivity of size classes and species due to mesh size and color would have to be considered. The most appropriate use of gill nets would probably be in conjunction with acoustic surveys to verify the faunal composition of an area that was acoustically sampled.

5) Automatic jigging machines used commercially by the Japanese may also be appropriate for some assessment purposes, e.g., indexing relative abundance in certain situations. Machines may select for "larger" individuals of light-attracted species; hence it may be necessary to verify jig catches with catches using other gear (e.g., gill nets).

6) Predator food habits studies have potential for estimating the faunal composition of an area, for delineating ecological relationships between species, and for estimating prey biomass. Two analytical techniques were discussed: ratio and ration methods. MacCall's *Loligo* assessment is an example of a simple ratio approach. In ration methods, one estimates the biomass of a prey type consumed by a predator population by estimating the daily ration of that item, and the size of the predator population. One must then relate the biomass of the prey consumed to the total biomass of the prey population by methods similar to virtual population analysis.

Food habit studies require large amounts of the time of technicians to sort and identify gut contents. John Hunter proposed the technique of dietary immunoassay to reduce analysis time. In this method a protein (or series of proteins) specific to the prey group is isolated, and a dye developed which binds with the protein(s) and is detectable by fluorescence. The sample is then exposed to ultraviolet light or other light and the antibody-dye group fluoresces, indicating the presence of the protein. This method could possibly be developed to identify squids in predator stomachs, and also could be used to detect larval and juvenile "predators" in the stomachs of squids to further clarify trophic relations.

7) Egg-production methods, developed at the SWFC for estimation of anchovy biomass, are very promising for use on some types of squid populations. Given that squid eggs can be identified and have a pelagic phase, it is possible to estimate spawning biomass. To use this procedure information on egg abundance-at-stage of development (from trawl surveys), estimates of batch fecundity, spawning timing and locality are needed.

Meeting participants concluded that assessing squid population size or biomass and the possible relations with dolphin and tuna populations, is a long-term study. In the immediate future, work can begin on a number of areas that will advance the capability to assess squid populations, but have applications for other uses as well. The most promising areas for immediate

attention are related to predator food habit studies and acoustic methods. The immunoassay technique could be explored for detecting squid (and possibly other major prey types) in the stomachs of higher-level predators.

Biological Systems Investigations

Fish Tissue Type and Method of Tissue Preservation Surveyed for Yield of Good Quality Mitochondrial DNA

John Graves, Fishery Biologist, has been working to establish the best tissue type and freezing procedure for obtaining mitochondrial DNA (mtDNA) from albacore for stock identification studies.

Analysis of samples of albacore liver tissue for mtDNA restriction patterns (and stock identification) has been hampered by an inability to consistently isolate good quality, high molecular weight DNA. High concentrations of endogenous nucleases in fish liver tissue, disruption of cell organelles due to ice crystal formation during the freezing process, or both may be a likely cause. To establish the best tissue type and freezing procedure for tuna sample collection, Graves analyzed a series of scomber tissues under a variety of freezing regimes.

Tissue	Fresh	Liquid nitrogen	Dry ice	Chilled on ice then frozen -20
Liver	+	-	-	-
Heart	++	+	-	-
Red muscle	++	+	+	-
Testes	+	+	+/-	-
Ovary	+++	++	+	+/-

These results indicate that ovary tissue produces the greatest yield of good quality mtDNA. This is the case because ova have about 3000x the numbers of mitochondria than other cells. They have 1/2 the amount of nuclear DNA (haploid number) and fewer nucleases than other cells.

Visiting Scientist Demonstrates Mitochondrial DNA Analysis Techniques to Laboratory Staff

Dr. M.J. Johnson, Salk Institute, La Jolla, spent two weeks at the SWFC demonstrating restriction digests of mitochondrial DNA (mtDNA), southern transfers and hybridization methods to interested laboratory members. These techniques are all necessary for the analysis of mtDNA for determining relatedness. Johnson has authored a series of papers describing the

relatedness of the human racial types using restriction analyses of mtDNA extracted from blood samples from 200 individuals. This work required mass production-level processing of the restriction digests, southern transfers and hybridizations. Consequently, she was able to show the laboratory members many techniques to speed up the analyses without compromising the final product.

At the SWFC, Andrew Dizon, Fishery Biologist, is working on the analysis of the stocks of exploited dolphins, which is similar to an analysis of human racial types. Because of the similarity, Johnson is interested in assisting in the processing of the dolphin data. Her success with the analysis of the human racial types has encouraged Dizon to assume that mtDNA analysis on a reasonable number of samples can indeed be useful in examining subspecific relatedness in dolphins.

Time Significance of Layering in Some Mammalian Hard Tissues and Its Application in Population Studies

Dr. Albert Myrick, Fishery Biologist, published a paper (Proc. Third Intl. Theriol. Cong. Helsinki, 15-20 August 1982, E. Erkinero (ed.) ACTA Zool. Fennica, No. 171 (Vol. III):217-220, on the time significance of layering in some mammalian hard tissues. Since daily layers accumulate in prenatal enamel of teeth in many cetacean and sirenian species and lunar monthly layers (LMLs) occur in the prenatal dentine, both systems provide a potential means for estimating fetal growth rates and lengths of gestation. For these species, postnatal dentine and periosteal bone contain LMLs. LML counts increase the precision in determining ages and age-specific vital rates. When dates of death are known, LMLs may be used to determine birth months and reproductive patterns in a sampled population. If breeding is limited to a short period, LMLs may be used to determine the approximate months of death. The hard tissues in many terrestrial mammals appear to contain subyearly layering patterns which may be the same as those found in sirenians and cetaceans. Investigations of these patterns could result in more accurate definitions of age-related biological parameters for terrestrial mammal populations.

Progress Report: US-USSR Research on Reproduction Layers in Cetacean Teeth

A preliminary study of strongly contrasting layers (SCLs) in teeth of sexually mature female dolphins, conducted by Drs. G.A. Klevezal (USSR Academy of Sciences) and Albert Myrick has indicated that the number of such layers in a tooth may represent the number of calves born to a female. The study was carried out during Klevezal's one-month stay here during the winter of 1982. In the spring of 1984 Myrick was a guest of the USSR Academy of Sciences in Moscow for a month to participate in a follow-up study with Klevezal and D.D. Tormosov (Atlantniro, Kaliningrad). The researchers examined teeth of approximately 125 female sperm whales for reproductive SCLs in their dentine.

The findings were similar to those obtained in the study with dolphins; SCLs occur and are almost exclusively associated with the inferred postpartum condition. Moreover, the sperm whale SCL pattern revealed additional detail

suggestive to the researchers of nursing periods. Plots of distances, in years, between all SCLs in every specimen yielded a strong mode of 4 years and a mean of about 4.8 years. This interval is close to the estimated length of the calving interval obtained from other methods. Although the results fall short of direct proof, further studies are warranted. A manuscript describing the methods and results of the sperm whale investigation has just been completed and is undergoing review.

The more complex SCL pattern in sperm whales has encouraged the researchers to examine the dolphin teeth for indications of nursing activity. Myrick is contemplating further work on larger samples of dolphins and whales but nothing definite is planned and he is developing a proposal for the use of small mammals to make a direct discrimination of the nature of the dentinal SCLs. Results from the small mammal study should provide definitive information on the source of the SCLs.

NMFS-Sponsored Symposium Results in Publication of Book on Reproduction in Cetaceans

Ten years ago in La Jolla, California, an International Whaling Commission (IWC) advisory group on small cetaceans recommended a review of cetacean reproductive biology and modeling. The fruit of this early discussion evolved into an international symposium sponsored and funded by the Southwest Fisheries Center, the International Whaling Commission and the U.S. Marine Mammal Commission. Held in La Jolla, California, in December 1981, the Symposium attracted international workers from various fields: mathematicians and field biologists, physiologists and modellers.

This month, 38 papers by participants in the Symposium were published as a 500-page book, "Reproduction in Whales, Dolphins, and Porpoises," by the International Whaling Commission in Cambridge, England, (Special Issue 6: Reports of the IWC). The book was edited by Drs. William Perrin and Douglas DeMaster of the Southwest Fisheries Center and Robert Brownell of the U.S. Fish and Wildlife Service in San Simeon, California. Major sections of the book deal in detail with such subjects as problems and new approaches in methodology, case studies of populations, and the morphology, behavior, and physiology of reproduction in dolphins and whales. The book cover shows an Atlantic spinner dolphin and calf from an airbrush painting by artist Kenneth S. Raymond of the Southwest Fisheries Center, which also served as the logo of the 1981 conference.

Dr. Izadore Barrett, Director of the Southwest Fisheries Center, noted that the NMFS and others involved can justifiably take pride in the publication of this book which has added substantially to the stock of knowledge of the reproductive biology of the great whales and smaller cetaceans.

Consignment of Dolphin Specimens for Stock Identity Studies Nears Completion

William Perrin, Senior Scientist, reports that the National Museum of Canada, Ottawa, has accepted 58 dolphin specimens (skulls and skeletons) for preparation and curation. The specimens are part of a series of approximately 800 collected by technicians aboard fishing vessels involved in the purse seine fishery for tropical tunas in the eastern tropical Pacific Ocean: Stenella attenuata, the spotted dolphin, S. longirostris, the spinner dolphin; S. coeruleoalba, the striped dolphin and Delphinus delphis, the common dolphin. The specimens provided augment the collection of spotted and spinner dolphins with examples collected in areas south of the equator, just north of the equator and west of 115°W longitude. The samples of striped and common dolphins are primarily from off Central America and Baja California.

The material at the National Museum of Canada will be available for examination approximately 6 months after receipt. Forty-five specimens have been shipped and the remainder will be sent in September. The dolphins were photographed, measured, and dissected (to collect reproductive and stomach-contents data and samples) after which the skeletal material was rough-cleaned at the SWFC.

Other consignments have been to the Los Angeles County Museum (250 skulls prepared and curated under contract), the San Diego Natural History Museum, the Museum of Natural and Cultural History at Oklahoma State University, the Museum of Comparative Zoology at Harvard University, the British Museum, the National Museum of Japan, the National Museum of Natural History in Paris, and the Oceanographic Museum of La Rochelle. A remaining series of 30 skulls will go to the Texas Cooperative Wildlife Collection at Texas A&M University.

Multispecies Data Management and Fisheries Monitoring Program

Status of Puerto Rico Biological Sampling Program

Foreign-caught Atlantic tunas transshipped to Mayaguez, Puerto Rico, continue to be sampled for length, weight and species composition by biological technician Eugene Holzapfel. Results of the sampling during the period January 1, 1984 through August 30, 1984, are as follows:

Species	Gear	Samples	Number sampled
Yellowfin	Baitboat	5	319
	Purse seine	7	427
	Unknown	3	202
Skipjack	Baitboat	8	410

	Purse seine	2	103
	Longline	3	70
	Unknown	1	50
Bigeye	Baitboat	3	171
	Purse seine	6	270
	Unknown	1	80

Meeting of the SWFC Tuna Data Management Committee Held in Honolulu

Al Coan, Chairman of the Tuna Data Management Committee, and computer specialist Fletcher Riggs hosted the 1984 meeting of the tuna data management committee in Honolulu, Hawaii, on August 6-10.

A prototype data catalog, developed by programmers Eugene Sibbald, Christina Show, and Hounq Bui of the La Jolla Laboratory on the La Jolla Standard Z80 Microcomputer, for fisheries data maintained by both the La Jolla and Honolulu Laboratories was introduced by Coan to meeting participants and to researchers at the Honolulu Laboratory. The catalog concept was well received and was adopted by the committee for implementation for all tuna fishery data. Final versions of the catalogs are scheduled to be completed in November after comments have been received from reviewers. The committee also discussed expanding its goal from that of a monitoring committee for nonduplication of data collection efforts to one of also developing systems (mainly micro based). The next step for the committee is the development of a standard catch data base for use at both laboratories.

Status of 1984 Tuna/Dolphin Observer Data

Biological technician Al Jackson reports that two tuna/dolphin technicians departed in August on cruises aboard commercial seiners fishing in the eastern tropical Pacific. One of these technicians is to collect data for the NMFS; the other will collect data under the direction of the Inter-American Tropical Tuna Commission (IATTC). One NMFS technician completed a cruise this month and data from two NMFS cruises were received. The table below summarizes the status of tuna/dolphin observer data collected this year to date:

Cruise Number	Cruise type	Vessel depart	Vessel return	Data received	Data edited	Database loaded
876	IATTC	1-04-84	2-15-84	*	*	*
877	IATTC	1-12-84	3-05-84	*	*	*
878	IATTC	1-22-84	4-02-84	*	*	*
879	IATTC	2-07-84	4-10-84	*	*	*

880	IATTC	3-18-84	5-10-84	*	*	*
881	IATTC	3-29-84	6-29-84	*	*	*
882	IATTC	4-11-84	6-28-84	*	*	*
883	IATTC	4-22-84	7-11-84	*	*	*
884	NMFS	4-29-84	6-13-84	6-22-84	7-31-84	
885	IATTC	4-30-84	7-03-84	*	*	*
886	IATTC	5-03-84	7-11-84	*	*	*
887	NMFS	5-09-84	7-28-84	8-13-84		
888	NMFS	5-10-84	7-23-84	8-08-84		
889	NMFS	5-10-84	6-25-84	7-06-84	7-27-84	
890	NMFS	6-04-84	8-22-84	8-31-84		
891	NMFS	6-26-84				
892	NMFS	8-03-84				
893	SWFC**	8-08-84	8-27-84	8-27-84		
894	IATTC	8-21-84		*		

NMFS Total	7	7	5	5	2	0
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*Data collected on IATTC cruises are not routinely incorporated into SWFC-managed data bases.

**Cruise 893 is a research vessel cruise designed to collect data on albacore. Collection of marine mammal sighting data was a secondary objective.

PACIFIC ENVIRONMENTAL GROUP

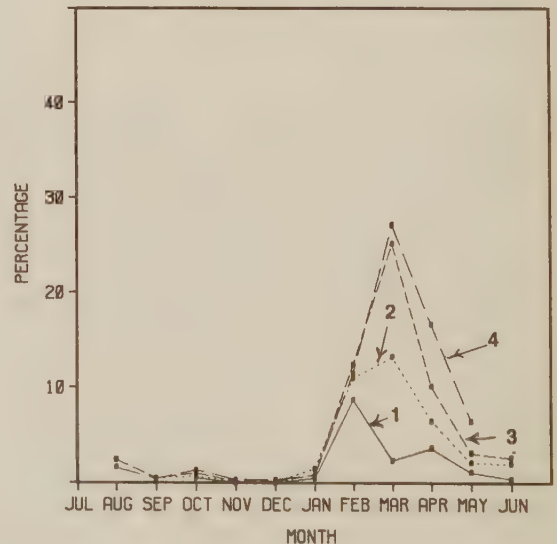
Monterey, California

Reproductive Physiology of Northern Anchovy Studied

Recent SWFC research findings on the reproductive physiology of northern anchovy suggest that anchovies spawn approximately once a week during their spawning season and that they spawn about 20 times a year. These studies imply that the annual fecundity per unit of parental biomass may be highly variable and it may be dependent upon the nutritional state and age structure of the stock. Fishery biologist Richard H. Parrish and statistician Donna L. Mallicoate of the Pacific Environmental Group and Richard A. Klingbeil of the California Department of Fish and Game (CF&G) have completed a manuscript in which they used biological data from the CF&G's fisheries sampling and sea survey programs to describe the maturity stages, spawning incidence, and age-dependent annual fecundity of northern anchovy.

The data bases consisted of biological data on 60,661 anchovies sampled in the San Pedro fishery during the period of 1966-80 and 54,457 anchovies sampled in the sea survey program during the period of 1966-83. The proportion of females in the maturity stages with hydrated eggs (15.3%) at sunset was found to be a valid index of the proportion of females spawning per day. This was verified by a comparison with the daily spawning incidence (14 to 16%) and time of spawning reported by John R. Hunter and co-workers in their studies of the histology of the ovaries of anchovies.

There are large, age-dependent variations in the daily spawning index of anchovy as the spawning season progresses (Figure 1). In January all age groups have a very low spawning index. Spawning commences in February and all age groups have roughly the same spawning index (9% to 12%). In March the spawning index of age group 1 declines to about 2%; it increases slightly in April and declines to about 1% in May. In age group 2 the spawning index increases to 13% in March and then declines to about 2% in May. Age groups 3 and 4+ have peak spawning indices in March (25% and 27%), considerable spawning in April (10% and 17%) and lesser amounts in May (3% and 6%) and June (3% and 6%).



To assess age-dependent fecundity in the central stock of northern anchovy, the number of spawnings and the fecundity were calculated on a monthly basis from January to June for anchovy in their first, second, third,

and fourth plus spawning seasons. Older females were found to have a much larger number of spawnings per season than younger females. During their first spawning season females spawned an average 6.8 times. In their second spawning season this rises to 15.2 times and in their third and fourth plus seasons this rises to 22.8 and 31.9 times.

Total fecundity during the spawning season is heavily age-dependent; the average 4+ years old female produces more than 8 times as many eggs as a 1 year old. On a per unit weight basis 1, 2, 3, and 4+ year old females produce 3701, 8041, 13025, and 16470 eggs per gram body weight per season. Four-year-old female anchovies produce nearly 4.5 times as many eggs per unit of weight as one year olds.

TIBURON LABORATORY

Tiburon, California

Million-Dollar Shark Gets Away and So Do NMFS-Tagged Sharks

On August 18, San Francisco Bay anglers attempted to catch a leopard shark worth \$1 million. The fish had been released the previous day by the Alta Bates Foundation, a local hospital fund-raising group, which hoped to use the proceeds for health care services at Alta Bates Hospitals in the East Bay. But the million-dollar fish...as well as some NMFS-tagged leopard sharks...got away.

It was hoped that some of the leopard sharks tagged and released in the Bay by Sue Smith, Fishery Biologist at Tiburon, might be caught during the one-day fishing contest. Smith released 948 leopard sharks in the Bay in 1979 to learn more about the age, growth and movements of the local shark population. Since then, 87 fish have been recaptured. To alert potential contestants to the presence of NMFS-tagged sharks, Smith conferred with members of the Alta Bates Foundation, and press releases were issued, leaflets describing the shark-tagging program were distributed at contest registration locales, and Laboratory Director Norman Abramson was interviewed on the subject by KTIM radio August 17 the day before the contest.

But the big Hook-A-Million Day came and went, and no tagged sharks were caught. Although fishing activity on the Bay was reportedly intense the day of the contest, only 700 anglers registered for the event, and relatively few sharks were caught. Smith believes the small number of catches and lack of returns resulted from the fact that most anglers fished in the central part of the Bay (where the Alta Bates fish was reportedly released), and not in the South Bay, which has a much larger concentration of sharks.

Another one-day shark fishing derby, with prizes for the largest fish caught, will be held on Saturday, September 8. Most fishing will take place in the South Bay, and Smith hopes that some of her fish will be returned during that event, as they were during last year's Shark Derby in September. The return of each tagged fish provides valuable information on leopard shark age and growth during the 5 years that have elapsed since they were tagged and released into the Bay.

Fish Community Investigation

Nearshore Habitats at Santa Catalina Island Continue to Be Affected by El Niño Conditions

The nearshore marine habitats at Santa Catalina Island continue to be affected by elevated water temperatures, much as they were at this time last year (see SWFC Monthly Report, October 1983), as observed during a study at the Island by investigation leader Dr. Edmund Hobson, fishery biologist Tony Chess and fisheries technician Dan Howard. In fact, the effects on giant kelp, Macrocystis pyrifera, which last year were seen in a stunted condition, are even more evident now. At present these massive plants have essentially disappeared from all reefs on the north side of the island where once they were the dominant feature (Figure 1).



Figure 1. A biologist from the Tiburon Laboratory notes the depleted condition of giant kelp, Macrocystis pyrifera, at Santa Catalina Island. Prior to El Niño, the reef on which he kneels supported a dense growth of this massive plant. Here he faces an isolated plant that grows from deeper water on the reef's edge. Note, however, that above a point level with the reeftop this plant is decomposing. The few other plants that grew in similar circumstances along the reef edge showed that same condition.

The striking effects of the unusually warm water on the fishes continue to influence their species composition, especially in the general absence of such previously prominent temperate groups as the rockfishes and surfperches on reefs shallower than 20 m. On reefs deeper than about 35 m, however, these species remain as abundant as they were before the recent El Niño.

FISHERIES INFORMATION SYSTEMS & ADP

San Diego Supercomputer in Planning Stage

The SWFC is a member of the San Diego Supercomputer (SDSC) Consortium. The Consortium which also includes the National Science Foundation (NSF) hopes to obtain support to have a Cray X-MP Supercomputer installed at a new computer center on the campus of the University of California, San Diego. Membership in the Consortium will allow the SWFC access to the Supercomputer at little or no charge.

According to Fred Kellenberger, who has attended meetings of the SDSC, the Supercomputer is designed to perform scientific calculations at ultra-high speeds. It offers a 4,000,000 word-memory and massive on- and off-line storage capacity. The system can be accessed remotely via 112 kbit/second communication network.

A wide variety of I/O facilities will be available including high-resolution graphics and film output for animation. The software will include compilers, mathematical and graphical program libraries and utility program. FORTRAN is the main scientific language used with the system. Consultations and training support will be provided to users.

ADP Development at Southwest Region

Gerry Hornoff, Systems Analyst for the SWFC stationed at the Southwest Region (SWR) Terminal Island, California, has completed a computer cost report for the SWR. The SWR performs 95% of its machine data processing on two mainframe systems, using a Dec-20 that is provided by Information Consultants Inc. (ICI) as its primary computer system. The main use of ICI is for enforcement, market news and financial systems. The SWR connects to the system by dialing local phone numbers which access national communications.

The second major computer system that the SWR utilizes is the UCSD computer center, which operates a system of linked VAX processors. The SWR uses this system to access data bases maintained by Center employees (PACFIN Research System, Susan Iacometti) or to comply with California State law regarding the transfer of California Department of Fish and Game data. During the first three months of FY 85, the SWR, in cooperation with the SWFC, will implement IBM Microcomputer at the various SWR offices.

Progress Continues in Processing PACFIN Data

The processing of information from Oregon and Washington landings and vessel registration data in 1982 for inclusion in the PACFIN data base is underway. Raw data files from California were received in August, written to

disk and backed up so that the tapes could then be returned to the State. The data was turned over to systems analyst Gerry Hornoff at Terminal Island who is processing the data into the proper format for PACFIN.

Other ADP Activities

The Laboratory Report covering finances at the La Jolla Laboratory and the Center report, which is a summary financial statement, were included for the first time in August 1984 as part of the Financial Reporting System (FRS). Two new financial reports, Resource Review and Labor Plan Commitment, will be included in September 1984. With the inclusion of these reports, the FRS will be fully implemented.

MISCELLANEOUS

Center Librarian Dan Gittings Retires

On August 10, 1984, 150 members of the staffs of the Inter-American Tropical Tuna Commission and the Southwest Fisheries Center at La Jolla, California, gathered at the Martin Johnson House on the Scripps campus to bid a fond farewell to Dan Gittings who retired after a government career of 28 years, the last 20 as the Center's Librarian. Director Barrett presented Gittings with a Sustained Superior Performance Award and a check for \$1,500, and the employees of the Commission and the Center's four laboratories gave Gittings a \$500 check. A special gift for Gittings was a leather-bound book of letters from his many friends to express their appreciation and regard.

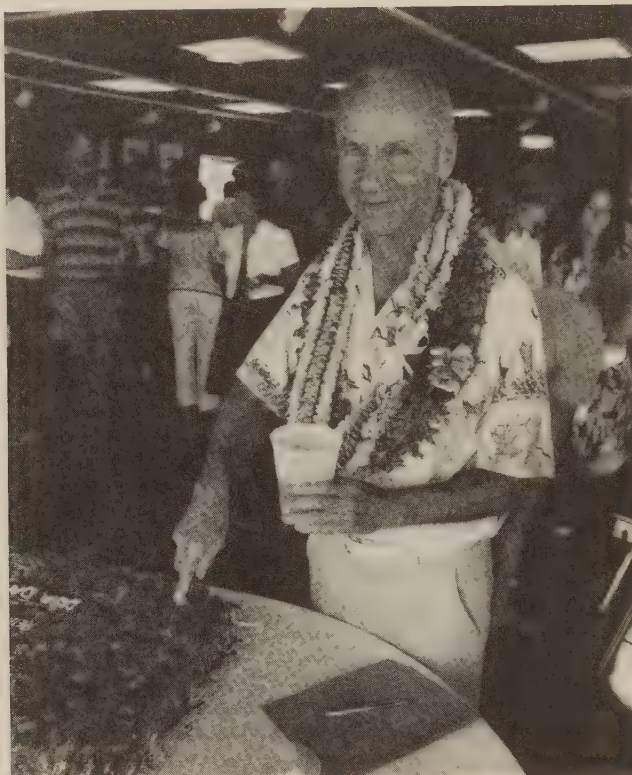
Veteran employees at the Center remember the day in 1965 when Gittings arrived at the newly built Fishery-Oceanography Center (as it was then called) to take on the job of Librarian and begin the task of building a fisheries library. Large, empty rooms, bare stacks, and unpacked cardboard boxes containing a miscellaneous collection of books, periodicals and several thousand reprints constituted the so-called library at the beginning.

With many years of library experience in fisheries science, Gittings was uniquely qualified, both professionally and personally, to undertake the building of a specialized library designed to serve the needs of fishery scientists.

In the 20 intervening years, through consolidation with the library holdings of the Inter-American Tropical Tuna Commission which occupies quarters in the Center, the remnants from closed Bureau of Commercial Fisheries Laboratories, and judicious purchases, Gittings created an outstanding fisheries library. With the closing several years ago of the California Department of Fish and Game fisheries library at Long Beach, California, the Center library became the only fisheries library open to the general public and to outside researchers in the southern California area. With its emphasis on fisheries literature, marine biology and oceanography, the library is in constant use by Center personnel, visiting marine scientists, undergraduate and graduate college and university students, elementary and high school pupils, commercial and recreational fishermen, lawyers, economists, conservationists, museum docents, and the interested and involved citizen.

Dan Gittings' outstanding professionalism, dedication to his work and devoted service to all users of the combined Southwest Fisheries Center Inter-American Tropical Tuna Commission Library--scientists and laymen alike--have been recognized by the U.S. Department of Commerce with the award of a Bronze Medal in 1981 and numerous NMFS citations and awards throughout the years.

Gittings noted that he expects to spend his leisure hours,..."slashing at the shrubbery, growing beans, tomatoes and noxious weeds, grumbling at the grandchildren, and, of course, monitoring such cultural events on TV as the progress of the San Diego Chargers."



Dan Gittings on the occasion of his retirement. The beautiful orchid leis around his neck were a gift to Dan and his wife, Ruth from Hazel Nishimura, Librarian at the Center's Honolulu Laboratory.

Public Affairs

Honolulu Laboratory

- August 10 - Dr. George Boehlert served as a panel member at a meeting of the Waianae Community Forum on ocean thermal energy conservation (OTEC) organized by Neighborhood Board Number 24 to discuss the potential impacts of the proposed Kahe Point OTEC facility on fishery resources.

La Jolla Laboratory

- August 7 - Earl Weber gave oceanography students from San Diego City College a tour of the NOAA Ship David Starr Jordan.
- 17 - Alec MacCall presented a lecture on mathematics in fishery management to a group of 35 junior and senior high school math and science teachers at the USC Marine Science Center on Catalina Island. The lecture was part of an honors symposium convened by the Los Angeles Educational Partnership, a newly formed foundation seeking to improve the quality of public education by means of collaboration between private industry and public schools. The purpose of the symposium was to improve teacher effectiveness by acquainting them with recent advances and technology, and to develop classroom applications of the material presented.

Pacific Environmental Group

- August 7 - Paul Sund spoke to the Carmel Mission Kiwanis Club on the Life History of the California Gray Whale.

Awards and Honors

Pacific Environmental Group

- August 3 - Andy Bakun, Chief PEG, presented a Quality Step Increase to Dr. Roy Mendelsohn and Special Act or Service Award to Rosemary Troian.

Tiburon Laboratory

- August 21 - Sharon Moreland, Biological Technician, Special Act Award.

Press Releases

Honolulu Laboratory

- August 14 - "Research Vessel Completes Fishery Survey."

Tiburon Laboratory

August 10 - "Fishing contest may benefit federal shark research."

Seminars

Honolulu Laboratory

August 1 - Dr. Bruce McCain, National Marine Fisheries Service, Northwest and Alaska Fisheries Center, Seattle, Washington, spoke on "Pollution studies in Puget Sound: Chemical contaminants and diseases of bottom fish."

La Jolla Laboratory

August 2 - Alberto Gonzalez-Garcés, Instituto Español de Oceanografía, La Coruña, Spain, spoke on "Recent trends in Spanish Fisheries."

14 - Michael Scott, Inter-American Tropical Tuna Commission, La Jolla, California, presented a talk, "A Long-term Tagging Study of Wild Bottlenose Dolphins: Blending Science and Mud Wrestling."

Tiburon Laboratory

August 10 - Dr. Siamak Khorram, North Carolina State University, Computer Graphics Center, presented, "Remote Sensing of Water Quality in the San Francisco Bay-Delta Estuary and Near Coastal Waters." The Tiburon seminar series is a cooperative effort of the Paul F. Romborg Tiburon Center for Environmental Studies (San Francisco State University) and the Tiburon Laboratory.

29 - Dr. Mark D. Ohman, University of Washington, Friday Harbor Laboratories, presented "Birth and Death in a Copepod Population: Control by Predation or by Food Limitation."

Visitors

Honolulu Laboratory

- August 1-2 - A. Farid and N. Siregar from Indonesia.
- 2 - Murraray Dailey and Robert C. Thren of the Hawaiian Shrimp Co. visited Richard Shomura and Dr. Jeffrey J. Polovina to discuss a collaborative arrangement to analyze data of commercial catches of deepwater shrimp, Heterocarpus laevigatus, made by the company.
- 6 - Dr. Gregor Cailliet, Moss Landing Marine Laboratories, Moss Landing, California, visited Dr. George Boehlert to discuss research on age determination.
- 8 - Dr. James D. Parrish, Hawaii Cooperative Fishery Research Unit, U.S. Fish and Wildlife Service, visited Richard Shomura to discuss Council and SSC matters.
- 21-23 - William High of the Northwest and Alaska Fisheries Center, Seattle, Washington, presented a course on emergency first aid.
- 27 - Dr. Reuben Lasker, SWFC La Jolla, California, visited Acting Director Richard Uchida, Dr. George Boehlert, Dr. Jerry A. Wetherall, and Dr. Jeffrey Polovina.
- 30 - Dr. Edward P. Meyers, NOAA Ocean Minerals and Energy, Washington, DC, and Dr. George Boehlert discussed the Honolulu Laboratory's current and planned research activities relating to impacts of proposed OTEC facilities on fisheries.
- 30-31 - Sharon Lundin, WASC Personnel Division, Seattle, Washington, briefed Honolulu Laboratory supervisors on a number of changes in Department of Commerce personnel regulations, procedures, and forms.

La Jolla Laboratory

- August 8 - Robert May, Senior Aquaculture Specialist from the Asian Development Bank, Manila, Philippines, visited John Hunter.
- 16 - Xu Gouling of the Zhanjiang Fisheries College, Guangdong, China, visited the Center.
- 27 - Dr. Julian Pepperell, an Australian who manufactures T-bar fish tags, visited Jim Squire.

- 28 - Jennifer Carter of Los Angeles, California, television station WQED visited Michael Laurs to discuss a television documentary on the oceans.

Pacific Environmental Group

- August 10 - Dr. Pierre Kleiber, SWFC, La Jolla, California, visited PEG and discussed computer matters with Dr. Roy Mendelssohn.
- 16 - Chris Mooers, Chairman of the Oceanography Department NPS, met with Paul Sund of PEG regarding NPS and NMFS participation in the grand opening of the Monterey Bay Aquarium on October 20.

Tiburon Laboratory

- August 10 - Dr. Peter M. Takvorian, Rutgers University, Department of Zoology and Physiology, met with Mickey Eldridge.
- 22-24 - Carolyn Riley Payne, WASC Personnel, Seattle, Washington, visited the Tiburon Laboratory for orientation and discussion of personnel matters.

Meetings and Travel

Honolulu Laboratory

- August 8 - Richard Shomura departed Honolulu for: Noumea, New Caledonia, to participate in the South Pacific Commission Technical Meeting on Fisheries (8-13 to 8-17); Jakarta, Indonesia, to chair (1) the stock assessment workshop (8-20 to 8-22) and (2) the meeting of the Standing Committee on Resources Research and Development (8-23 to 8-29); Taipei, Taiwan, to meet with Dr. R.T. Yang and Dr. T.F. Chen (8-31); Pusan, Korea, to meet with Dr. Yeong Gong (9-3 to 9-4); and Tokyo, Japan, to meet with Dr. John Gissberg, Fishery Attache, and Ryuichi Tanabe, Councillor, Fishery Agency of Japan (9-5 to 9-6).
- 28 - Dr. George Boehlert and research assistant Michael Seki attended a preapplication consultation meeting at the State Capitol regarding the application by Ocean Thermal Corporation (OTC) for a proposed OTEC facility at Kahe Point, Oahu. The meeting was attended by representatives of OTC and their contractors as well as governmental agencies including NOAA, the Coast Guard, Navy and State agencies.

La Jolla Laboratory

- August 5 - Mark Lowry traveled to Ensenada, Mexico, to transport supplies.
- 6-7 - Ben Remington met with DoC representatives and the A-76 contractor in Washington, DC.
- 8-10 - Barbara Engstrand attended a DoC purchase order payment training session in Seattle, Washington, and visited WASC contracting and procurement staff.
- 10-17 - Nancy Lo attended the annual joint statistical meetings in Philadelphia, Pennsylvania, and presented a talk on "Modeling life-stage-specific mortality rates of anchovy eggs and larvae."
- 12-13 - Dan Huppert went to Denver, Colorado, to meet with contractor of Energy and Resource Consultants, Inc.
- 12-17 - Gary Sakagawa traveled to Ithaca, New York, to attend the American Fisheries Society meeting and to participate in a Marine Fisheries Section meeting.
- 16-18 - Alec MacCall traveled to Catalina Island to present an anchovy model to science and math teachers.
- 20-21 - Doug DeMaster met with National Park Service staff to discuss pinniped research in Ventura, California.
- 24-27 - Chuck Oliver traveled to San Clemente Island, California, to conduct monthly counts of sea lions.
- 27-31 - Gary Sakagawa attended a briefing of U.S. Commissioners to ICCAT in Washington, DC, and participated in a bluefin review panel meeting in Miami, Florida.
- August 29-
September 4 - William Perrin attended the first Biennial Conference and Symposium of American Cetacean Society in Monterey, California.

Pacific Environmental Group

- August 8-10 - Rosemary Troian traveled to WASC to attend a required training session on the CD-404, Supply, Equipment or Service Order which will replace the CD-45 on October 1, 1984. She also met with various WASC staff on Administrative matters.

Tiburon Laboratory

- August 8-10 - Walburga Giguere and Catherine Hurst traveled to WASC in Seattle, Washington, for training in the Department of Commerce Purchase Order Payment System.
- 13-17 - Industry economist Ed Ueber participated in a symposium in New Zealand. He also held discussions with New Zealand and Australian fish processors and brokers regarding import of fish products from California.
- 28-29 - Sus Kato traveled to Crescent City, California, with a fish broker from the Bay Area to help arrange production of a sample of "white fish meal" from Pacific whiting. Castle Rock Seafoods, a firm which is processing whiting in Crescent City, California is having difficulty getting rid of waste products.

Personnel

Honolulu Laboratory

- August 1 - David K.H. Louie, Computer Technician - Resignation.
- 17 - Daniel R. Locey, Computer Science Student Trainee (NOAA Jr. Fellow) - Resignation.
- 24 - Gail A. Peiterson, Biological Technician (Wildlife) - Resignation.
- 27 - Julie J. Eliason, Biological Technician (Wildlife) - Extension of Temporary Appointment.

La Jolla Laboratory

- August 3 - Marian Ray, Library Technician - Resignation.
- 15 - Laura Patla, Biological Technician - Resignation.
- 20 - Paul Robertson, Operations Research Analyst - Entered on Duty.
- Dale Squires, Industry Economist - Entered on Duty.
- 21 - Sandor Kaupp, Biological Technician - Termination of Appointment.

- 29 - Stephanie Sexton, Computer Clerk - Entered on Duty.
- 31 - Sunnie Park, Biological Aid - Resignation.
- Drew Stanley, Biological Technician - Resignation.
- Brian Edwards, Industry Economist - Resignation.
- Thomas Tumosa, Biological Technician - Transferred to Department of Defense.
- John Jenson, Biological Aid - Termination of Appointment.
- Daniel Gittings, Librarian - Voluntary Retirement.

Pacific Environmental Group

- August 31 - John Trares, Oceanographer - Resignation.

Tiburon Laboratory

- August 19 - Rahel Fischer, Secretary - Promotion.
- 22 - Gregory Hall, Biological Aid - Expiration of Temporary Appointment.

Training

Honolulu Laboratory

- August 13-17 - Dr. George Boehlert completed a course on Supervision and Group Performance presented by the Office of Personnel Management.
- 21-23 - William High of the Northwest and Alaska Fisheries Center taught a course, "Handling Medical Emergencies at Sea" to 20 staff members of the Honolulu Laboratory.

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